Technology to Support Immigrant Access to Social Capital and Adaptation to a New Country

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The key to successful adaptation for immigrants in a new country is their social capital, or those resources embedded in their social networks. Research suggests that information and communication technologies (ICTs) foster immigrants' social capital and facilitate their adaptation. However, it is unclear how recent immigrants use ICTs to develop social capital and how this supports their adaptation needs. We performed semi-structured interviews with thirteen recent immigrants and five long-term immigrants. We found that ICTs and technology-mediated connections: (1) easily addressed immigrants' settlement needs, (2) minimally addressed their financial and cultural needs, and (3) were not used to address their emotional needs. To support recent immigrants' adaptation, we suggest ways for ICTs to (1) reduce uncertainty about meeting local-born populations, (2) foster reciprocity among immigrant communities, and (3) facilitate safe resource exchanges.

CCS Concepts: • **Human-centered computing** → **Empirical studies in collaborative and social computing**; • **Information systems** → *Collaborative and social computing systems and tools*; • **Social and professional topics** → *Race and ethnicity*;

Additional Key Words and Phrases: Immigrant; Social Capital; Adaptation; Qualitative Research; Semi-structured Interview;

1 INTRODUCTION

In the United States (U.S.), immigrants[1] are a major contributor to population growth. In 2015, 1.38 million foreigners migrated to the U.S., which was a two percent increase from the prior year. As of 2015, 13.3% of the U.S. population (45 million) was foreign-born. However, *adaptation* (i.e., the process of making adjustments in response to the new society) is a challenging process that can take years [7, 42]. Research has shown that immigrants face difficulties in health, employment, and cultural adaptation in their first few years of moving to a new country [6, 74, 75].

Social capital, or the resources embedded in one's social network [9, 61, 78], could lead to financial, cultural, and emotional support [20, 34] and thus plays an important role in the adaptation process

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[1]In the present paper, we refer to immigrants as those who are foreign-born and migrate to a new country in their adulthood. This definition not only covers those who are naturalized and who receive permanent resident status, but also those who move to a country and aim to stay for multiple years.

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[8, 18, 41, 56, 79, 81]. Recent immigrants who rely on offline social networks for job information and referrals can find their first job faster [23, 81] or find jobs with better wages [2, 38, 52] than those who do not. In addition, immigrants who receive support from social networks have lower immigration stress than other immigrants [40, 60]. Prior studies suggest that recent immigrants use information and communication technologies (ICTs) such as social media to develop new social networks in their adaptation process [22, 55, 59, 69], but it is unclear how the social networks mediated via technology lead to adaptation benefits. Prior work suggests that ICTs provide opportunities to foster social capital among underserved populations, such as those without a college education [43], residents in rural areas [46], and disadvantaged job seekers [24]. Such opportunities include connecting individuals from these populations to different networks to access new resources. While prior work has investigated how ICTs foster social capital of domestic migrants, or those who migrate *within* a country, to address their adaptation needs [47], little research has been done to understand the case of immigrants, or those moving to a new country. Because immigration remains one of the strongest economic advantages in the U.S., supporting immigrants in meeting their adaption needs can further lead to economic gains [93].

Despite the fact that ICTs have been shown to foster social capital among groups that are often marginalized [24, 43, 46, 47] and that these technologies could support immigrants' adaptation needs [21, 22, 55, 59], it is unclear how ICTs mediate or could mediate immigrants' adaptation needs. Therefore, we aim to answer the following research questions:

(1) What ICTs do recent immigrants use for developing new social capital to address adaptation needs?
(2) How do ICTs mediate recent immigrants' adaptation needs?
(3) What are the opportunities for ICTs to better facilitate immigrants' adaptation, and what limitations exist?

To answer the research questions, we conducted a series of semi-structured interviews with recent immigrants in the U.S. (N = 13). Recent immigrants in the present paper are defined as immigrants who have lived in their new country for five years or less, which is a common research practice in immigration studies (e.g., [15, 31, 47, 54]). We also included long-term immigrants (i.e., those who have lived in the U.S. for more than five years; N = 5) to contextualize recent immigrants' experience. We identify two factors that correspond to how immigrants address their adaptation needs: immigrants' *primary motivation* for using ICTs and the *ethnic diversity* of the populations that they aim to reach. ICTs are most likely to mediate immigrants' settlement needs, such as housing, transportation, and orienting information through their new connections. In contrast, immigrants' cultural adaptation needs (e.g., language adjustment) were not fully addressed online. Instead, these cultural needs can only be addressed when ICTs are used to facilitate offline social activities with local populations. We also extend prior research by finding that ties among an ethnic community are beneficial *beyond* providing basic job information in online contexts [22]. To summarize, this paper:

- Extends prior literature [22, 55, 59, 69] by identifying what ICTs recent immigrants use to develop new social capital and how these ICTs mediate between recent immigrants and their new networks;
- Contributes a framework to categorize ICTs for recent immigrants to develop new social capital and access resources;
- Identifies recent immigrants' concerns about these ICTs and offering design implications in which ICTs can support these populations in obtaining resources from their ethnic communities and the local-born population.

2 RELATED WORK

2.1 Immigrants' Adaptation Needs and Social Capital

Adaptation[2] refers to "*changes that take place in individuals or groups in response to environmental demands*" [7]. Immigrants must fulfill various needs to adapt to their host country's environment [6, 14, 74, 75, 85]. Immigrants acquire various resources in different migration phases to fulfill these needs. Broadly, adaptation needs can be placed into four categories: *Settlement, Financial, Cultural, and Emotional. Settlement needs* include food, water, shelter, transportation, and the information to orient oneself. *Financial needs* are met through employment and one's ability to earn income. *Cultural needs* support immigrants in terms of language development and learning the social norms of the host country. Finally, immigrants face stress associated with relocation and the reconstruction of their lives, which often leads to *emotional needs* that require support.

Research suggests that immigrants can successfully adapt when they establish *social capital* in their new country [8, 18, 41, 56, 79, 81]. Social capital refers to the resources and benefits that one can access through his or her social networks [9, 61, 78]. Following Putnam's definition, tightly-connected networks include strong ties such as job referrals, whereas loosely-connected networks include weak ties; weak ties are more likely to deliver new information outside of one's tightly-connected network [44].

In prior immigration studies, tightly-connected immigrant networks were defined as those where immigrants are connected to other immigrants who share the same ethnicity. These ties are referred to as INTRA-ethnic ties [58, 87, 91]. Loosely-connected immigrant networks are those networks with connections to their host country's local-born population. These ties are referred to as INTER-ethnic ties [57, 68, 87]. Two common assumptions in studies on immigrants' social capital [1, 29, 56, 58, 79] are that: (1) INTRA-ethnic ties are strong ties and are associated with bonding social capital, and (2) INTER-ethnic ties are weak ties and are associated with bridging social capital. Researchers have found that both INTRA- and INTER-ethnic ties support immigrants' adaptation, but they work in different ways.

2.1.1 INTRA-ethnic Ties. INTRA-ethnic ties allow recent immigrants to "survive" by quickly providing settlement resources in the host country [23, 81]. Research shows that ethnic communities in a new country support newcomer immigrants by providing orienting information, housing, and sometimes financial support [22, 30, 71]. It is also suggested that those who rely on INTRA-ethnic ties for the job search are more likely to find jobs than those who do not [23, 56, 63]. The ethnic community is also critical in mitigating immigration stress and providing emotional support [30, 35, 67].

While INTRA-ethnic ties provide resources for recent immigrants to survive, the flow of resources within an ethnic community is not always smooth. Issues such as malignant competition and free riding (e.g., when one receives information that leads to employment but does not reciprocate when others need to find work) occur when immigrants compete for resources [77, 79]. Understanding how recent immigrants use ICTs to form INTRA-ethnic ties and exchange resources within their ethnic community can lead to more benign interactions within these communities, and thus support them in smoothing and easing settlement, migration stress, and ethnic community development issues.

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[2]Different disciplines have used adaptation with other terms, such as assimilation and integration, interchangeably to describe the process [14]. However, assimilation and integration imply that an immigrant needs to maintain close relations with the mainstream society, which is not always true [7]. Using adaptation has the advantage of being neutral to the outcomes of an immigrant's changes to his or her new country [7, 42].

2.1.2 INTER-ethnic Ties. Compared to INTRA-ethnic ties, INTER-ethnic ties are said to be beneficial to immigrants' adaptation in the long term because these ties lead to mainstream societal resources [56, 81]. By accessing these resources, which are typically greater in terms of quantity than resources from the ethnic community, immigrants are more likely to thrive in the new country. For example, INTER-ethnic ties are said to be helpful to an immigrant's wage level [56] and career mobility [38, 52]. Immigrants who have more INTER-ethnic ties could also benefit their descendants by exposing them to more social events with the local-born population. This could improve their children's adaptation to the host country [97].

However, physical and social barriers such as residential and cultural segregation may prevent immigrants from developing INTER-ethnic ties [83, 87]. Recent immigrants could have a small number of INTER-ethnic ties and thus not be able to benefit in the same way as long-term immigrants [55, 98]. Understanding how ICTs succeed and fail to support immigrants in creating INTER-ethnic ties can allow researchers and designers to design ICTs to support their ability to develop social capital with INTER-ethnic ties.

2.2   ICT Support for Fostering Social Capital and Adaptation

ICTs support immigrants' successful adaptation by: helping them develop new networks and social capital [21, 22, 55, 59]; providing access to health information [53, 72, 84]; and helping them adjust their social identity [5, 62, 64]. Indeed, developing new networks and social capital is a major aspect of immigrants' use of ICTs for adaptation. Researchers have investigated opportunities for ICTs to foster social capital among underserved populations. These populations include those without a college education [43], residents in rural areas [46], and disadvantaged job seekers [24]. Opportunities to foster social capital include connecting individuals from these populations to different networks to access new resources, which is often required for successful adaptation among immigrants.

Dekker and Engbersen conducted a series of semi-structured interviews with 90 immigrants in the Netherlands to understand how immigrants use social media for developing social capital before and after their migration [22]. They found that new immigrants to the Netherlands sent invitations on social network sites or joined online groups of their ethnicity for new connections. After connections were created, the immigrants then used ICTs to enhance their newly established networks [22]. Dekker and Engbersen thus argued that ICTs complement other resources such as non-profit organizations and reduce the threshold for immigration by connecting immigrants to wider networks [22]. Other qualitative studies in different countries and the use of ICTs by immigrant populations have revealed similar findings [5, 55, 59, 69]. Additional quantitative studies have found positive correlations between immigrants' adaptation and their ICT use for social capital (e.g., use of social network sites [21], online communication with local populations [16], and use of hyper-local community applications in ethnically mixed neighborhoods [33]).

Despite finding that ICTs are beneficial for developing networks for recent immigrant adaptation, Dekker and Engbersen argued that establishing new connections online alone does not guarantee success. Instead, *how* an immigrant accesses and utilizes resources through these connections to meet his or her needs is most critical [22]. Little research, however, has systematically analyzed *how* immigrants use ICTs to mobilize their new networks for resources and how these resources address their adaptation needs. As examples, Dekker and Engbersen found that their participants only gained information about employment and legal documents from their new online connections [22], and Lášticová found that immigrants shared emotions by browsing through photos on Facebook [59].

An analysis of newcomers' ICT use in developing social capital and accessing resources was also conducted to study *domestic migrants*, those who migrate within a country. Through 350

interviews and log analysis of Newfoundland Kitchen, a website for Newfoundland residents, Hiller and Franz studied how domestic migrants used four types of ICTs (search tools, emails, BBS, and chatrooms) [47]. Although these new domestic migrants used search tools to look for resources in their destination, it is unclear whether they established social connections. Socially, these new domestic migrants used ICTs primarily to retain and maintain connections to their home city but not for new connections in the destination [47]. While Hiller and Franz argued that their findings on domestic migrants could inform research on international immigrants' adaptation [47], this research space has remained open for the last decade.

This paper contributes knowledge and understanding about *how* recent immigrants use ICTs to develop social capital and access resources and how this supports their adaptation needs through these connections. Although a few HCI and CSCW studies have been conducted to better understand immigrants' needs and their ICT use, these studies do not focus on adaptation. Instead, they specifically relate to immigrants' remote parenting of children left in the home country [12], immigrant female's health and wellbeing [11], immigrants' online identity transition on social media [62], and undocumented immigrants' online privacy concerns [45]. We contribute the types of ICTs immigrants use for developing INTRA- and INTER-ethnic ties and how these ICTs assist immigrants in addressing their adaptation needs. We also suggest reasons for participants' use and non-use of specific types of ICTs.

3 METHOD

To address our research questions, we interviewed recent immigrants (living in the U.S. for five years or less) and long-term immigrants (living in the U.S. for greater than five years). We interviewed long-term immigrants to help contextualize recent immigrants' experiences.

3.1 Interview Procedure

We conducted semi-structured interviews that lasted approximately one hour. At the beginning of the interviews, participants briefly introduced themselves, described their motivations for migrating to the U.S., and explained how they prepared for their migration. The interviewer also asked participants to highlight their biggest challenges after coming to the U.S. This part of the interview also included how immigrants used ICTs in their daily lives. We followed up with questions about the people participants chose to connect to or hang out with and what context they used to make these connections. We asked participants to specify the ethnicity of populations they connect and spend time with (i.e., were they from their ethnic community or INTRA-ethnic ties) or local-born (INTER-ethnic ties)? We then asked for more details about their interactions with these new connections, and whether they encountered challenges meeting people. The last question we asked was what technology services would be most helpful for recent immigrants.

3.2 Recruitment

We used two sampling methods to recruit participants: *reputational case sampling* and *convenience sampling*. Reputational case sampling is a common recruiting method for special populations [82] such as immigrants. Researchers using this method rely on experts' (i.e., community leaders, non-profit volunteers) reputations to recruit members of a specific group. Permission from a county-level, non-profit organization allowed us to distribute flyers.

For convenience sampling, we relied on both online and offline channels. We posted on local community groups' electronic bulletin boards, Craigslist, and Facebook groups. For online recruitment, we selected metropolitan areas that had large immigrant populations. We selected the areas by reviewing multiple online reports and articles illustrating the immigrants' geographical distribution

ID	Demographic	Home Country	Residential Area(s)	Duration in the U.S.
R1	Tina (F, 30)	Czech Republic	A large East-coast city	1m
R2	Akani (M, 35)	Nigeria	A large East-coast city	1y&6m
R3	Bing (M, 24)	China	A large West-coast city	4y
R4	Yu (F, 32)	Taiwan	A small Midwestern town	6m
R5	Camila (F, 28)	Mexico	A large Midwestern city	7m
R6	Ng (F, 34)	Vietnam	A large East-coast city & a small Midwestern town	4y&7m
R7	Antonio (M, 38)	Italy	Two large East-coast cities	2y&2m
R8	Lucas (M, 39)	Chile	A small Midwestern town	8m
R9	Huang (F, 47)	China	A small Midwestern town	1y
R10	Emily (F, 27)	France	A small Midwestern town	6m
R11	Zhang (F, 29)	China	A small Midwestern town	1y&5m
R12	Rahul (M, 25)	India	A large East-coast city	5y
R13	Zhu (M, 39)	China	A large West-coast city	2m
L1	Nadia (F, 28)	Kuwait	A small Midwestern town	5y&7m
L2	Elise (F, 76)	Netherlands	A small Midwestern town	~50y
L3	Li (F, 59)	China	A small Midwestern town	8y
L4	Claire (F, 35)	Albania	A large East-coast city	17y
L5	Allen (M, 38)	Russia	A large East-coast city	7y

Table 1. Participants' profiles. R1 - R13 are Recent immigrants and L1 - L5 are Long-term immigrants. The Demographic column shows participants' name (pseudonym), gender, and age. The Residential Area(s) column shows the areas that participants lived or had lived. Duration in the U.S.: y=year(s), m=month(s).

in the U.S.[3] [37, 73, 86, 96]. We did the same locally, again using Craigslist and Facebook groups for potential face-to-face interviews, which could be beneficial for communication [94]. We included local cities with large immigrant populations. For offline recruitment, we posted flyers in public libraries, supermarkets, and community centers. We used the following screening requirements to increase our chances of finding eligible recent immigrant participants. Participants had to:

- Be older than 18 years when she/he moved to the U.S.
- Not be on a B-1 (short-term business visitors), B-2 (short-term tourists), F-1 (international students), or J-1 (visiting scholars) visa when participating in the study. B-1 and B-2 visa holders are people who travel to the U.S. for short periods, and thus do not necessarily have time or need to adapt to the U.S. On the other hand, F-1 and J-1 visa holders are international students, who receive support from their academic institutions.
- Know basic conversational English. We set the basic conversational English requirement for the convenience of data collection and analysis. This research practice is used in prior HCI and CSCW-based immigrant research as well [11, 12, 62]. We reflect on the pros and cons of this decision in the Limitations subsection (subsection 7.4).

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[3]We posted online advertisements to recruit participants from the following areas: Phoenix (AZ), Los Angeles (CA), San Diego (CA), San Francisco (CA), San Jose (CA), Miami (FL), Chicago (IL), Boston (MA), New York (NY), Las Vegas (NV), Houston (TX), Seattle (WA), and Washington D.C. Also, for the convenience of offline recruitment, we recruited from areas with large immigrant populations around our cities.

3.3 Data Analysis

We conducted a total of 13 interviews with recent immigrants (seven females) and five interviews with long-term immigrants (four females). Table 1 presents detailed profiles of our participants. We denote Recent immigrant participants as R1-R13 and Long-term immigrant participants as L1-L5. Note that some quotes included in the present paper have grammatical issues because most of our participants were non-native English speakers.

Our interviews lasted from 42 to 107 minutes (Mean = 59.6 minutes). All 18 interviews were audio-recorded and professionally transcribed. The first author and a research assistant coded the transcripts line-by-line in multiple rounds. We used an open-coding approach [36, Ch.23] in the first round to identify salient topics in our data. The first author then developed the codebook based on the main themes of the interviews, including types of needs, features of each platform, and the types of resources our immigrant participants accessed in both online and offline contexts. The two coders discussed the coded transcripts and resolved conflicts after each round. The first author then added, removed, and integrated codes accordingly.

4 RESULTS

We identified two factors to describe participants' strategies for using ICTs to develop social networks and access resources. The first factor is participants' *primary motivation* for using these ICTs. We specify whether motivations for using these ICTs were *socially-driven* or *resource-driven use.* While it was common for participants to report a primary *and* a secondary motivation for using ICTs, in the present paper, we group the ICTs they used based on participants' primary motivations. For example, Emily (R10) joined a small local community of French immigrants on WhatsApp. Here, Emily's primary motivation was to establish a social network with her ethnic community (socially driven) while accessing resources through the network (resource-driven) was secondary. We therefore categorized Emily's use of this online group as socially driven.

The second factor identified was *the diversity of the population* that immigrants wanted to make connections to or sought resources from. The diversity is denoted as either *ethnically uniform* or *ethnically diverse.* Note that this factor is not a characteristic of an ICT, but of the ICT's user population. The same ICT can be used by different populations. For example, Facebook groups can be set up not only by an ethnic community within an ethnically-uniform area but also by residents in an ethnically-diverse, or mixed neighborhood.

We use the two factors — *the primary motivation* for ICT use and *the diversity of a population* that immigrants want to get in touch with to frame our findings and to structure how participants utilized ICTs to fulfill their adaptation needs. We use these two factors to categorize the ICTs which participants used to make new connections and address adaptation needs into four groups. Table 2 illustrates the results.

Per Table 2, most participants' adaptation needs were addressed through the mediation of ICTs. Settlement needs, such as housing, transportation, and orienting information, were addressed through all four ICT groups. Financial needs included finding employment and income sources; participants addressed these needs through public ethnic online groups and P2P commerce platforms. Cultural needs were primarily addressed through offline social events mediated by hybrid community platforms and people-nearby applications (PNAs). We also note that while prior work suggests that immigrants use ICTs to support their emotional needs [59, 64], this was not salient in our results.

We report our findings regarding participants' socially-driven ICT use in section 5 and resource-driven ICT use in section 6. Each subsection in section 5 and section 6 demonstrates how participants used ICTs to reach ethnically uniform and diverse populations. We report *needs addressed* and

Primary Motivation	The diversity of a population to reach	Instances of ICTs Used by Participants		Needs Addressed				Social Outcomes			Potential Concerns
				Settle-ment	Financial	Cultural	Emotional	New INTRA-ethnic Ties	New INTER-ethnic Ties	Detail	
Socially-Driven	Ethnically Uniform	Group 1	Private online groups of Chilean/French on WhatsApp	X				X		New connections among a tightly connected ethnic community with frequent social exchanges	
	Ethnically Diverse	Group 2	MeetUp, FB group for a local neighborhood (Hybrid Community Platforms)	X		X		X	X	New connections with individuals of the same ethnicity and also local-born individuals	
			Tinder, Mingle, WeChat (People-Nearby Applications)	X		X			X	New connections with local-born individuals	Concerns regarding meeting strangers
Resource-Driven	Ethnically Uniform	Group 3	FB group for Vietnamese immigrants in the U.S. ; Online Chinese Forum for a town	X	X			X		New connections with individuals of the same ethnicity and potentially a large ethnic community	
	Ethnically Diverse	Group 4	Glow, FB page of local news (Online forums for a specific topic or interest);	X						Little effect on one's social network	Low trust in users and resources on these ICTs
			Craigslist, FB Marketplace; Airbnb; (P2P Commerce Platforms)	X	X						

Table 2. The overview of our findings. This table reveals two important themes. First, settlement needs can be easily addressed through mediation of ICTs, while emotional needs were not salient in our findings. Second, participants who were resource-driven were less likely to build new social connections through ICTs that have an ethnically diverse population.

social outcomes through the mediation of these ICTs. We discuss social outcomes despite some participants' resource-driven motivations. We do this because the ICTs used, per our related work [24, 43, 46], afford the creation of new social ties, which we later discuss.

5 SOCIALLY-DRIVEN ICT USE

5.1 Creating Social Connections with an Ethnically Uniform Population (Group 1)

Group 1 ICTs included those ICTs that participants used to make social connections with people who shared the same ethnicity. Instances of Group 1 ICTs included private online groups that were built by small and strongly connected networks of people. While participants also sought resources through these private ethnic groups, this resource-driven motivation was often secondary.

These private online ethnic groups were built on instant messenger applications like WeChat and WhatsApp. Because these groups were private, our participants were only able to find them through their local ethnic community members. These private ethnic online groups were exclusive to small ethnic communities. Once a newcomer joins these private groups, she becomes part of a strongly connected community. While she benefits from the community, she is also expected to contribute to frequent resource exchanges among group members.

5.1.1 Settlement Needs Addressed. In these private ethnic groups, long-term immigrants actively provided settlement resources to recent immigrants, such as orienting information, second-hand goods, and services such as ridesharing. Emily (R10) and her husband were often invited to social gatherings held by the long-term immigrants in the French WhatsApp group. Emily (R10) also received instructions on applying for car insurance from the group. In their groups, Huang (R9) and Li (L3) shared information about courses and extracurricular activities to support Chinese students.

Both Lucas (R8) and Emily (R10) cited that these resources were easily shared and exchanged within the group because there were no language barriers.

5.1.2   Social Outcome: Creating New INTRA-ethnic Ties within a Strongly Linked Ethnic Community. These private ethnic groups facilitated social exchanges among community members. There was support of local ethnic communities via exchanges between long-term and recent immigrants. In Lucas' (R8) Chilean group on WhatsApp, for example, newcomers received free second-hand items, services, and information from long-term immigrants. As the newcomers adapted to the new society, they were expected to continue the tradition. At the time of the study, Lucas (R8) had lived in the town for eight months and felt comfortable driving around the town. Therefore, he and his wife contributed to the community by providing resources and support to community members who did not have access to a car.

> "*[A long-term Chilean immigrant], in fact, gave us a desk chair, a microwave, some furniture... They told us, 'we are going to give you this, but you don't get to sell that. You have to give it away the same way we give it to you...' If someone is coming to [the town Lucas lived] we will do the same... Not everybody have a car so, when [my wife and I] rent a car, we tell them, 'We have a car now, we're going to Costco, we're going to Meijer, we're going to do something, or we're going to [a nearby town], if somebody wants to go with us?'*" [Lucas (R8)]

While these private groups require permission to access, they were beneficial for communities to develop strong connections. Both Lucas (R8) and Emily (R10) were invited to join their ethnic community's private groups. They would not have been able to access these groups if the community leaders in the closed groups had not met with them offline or did not have access to newcomer information. In contrast, Elise (L2), the most senior long-term immigrant study and vice president of a local long-term Dutch community, in our study, was not successful in engaging new Dutch immigrants Through word-of-mouth, she invited Dutch newcomers to attend information-sharing talks and weekly gatherings; few newcomers, however, participated in these events. Elise (L2) attributed this disconnection to the generational differences between the long-term Dutch community and recent Dutch immigrants.

5.2   Creating Social Connections with an Ethnically Diverse Population (Group 2)

When immigrants want to develop new connections with ethnically diverse populations, Group 2 ICTs are beneficial. Group 2 includes two types of ICTs: *hybrid community platforms* and *people-nearby applications* (PNAs). Hybrid community platforms include MeetUp, Facebook groups for local communities, and also bulletin boards for local groups on Craigslist. PNAs include applications such as Tinder, Mingle, and specific WeChat features. Group 2 ICTs provide opportunities for making social connections with people from their ethnic community *and* local born-populations. By meeting members of the local-born population, participants could then use these ICTs to address their settlement and cultural needs.

A common feature of hybrid community platforms and PNAs is fostering offline social encounters. Hybrid community platforms facilitate offline group gatherings [66, 95], and PNAs facilitate offline encounters between two individuals [49, 88, 90]. Recall that with Group 1 ICTs, participants had no concerns making new connections within their ethnic community. However, some participants had concerns using Group 2 ICTs to meet with strangers and make new social connections.

5.2.1   Settlement and Cultural Needs Addressed. Four participants used hybrid community platforms to find local information and practice their language skills. Camila (R5) and Antonio (R7) used

hybrid community platforms to participate in their native-language exchange groups. When participating in these groups offline, Camila (R5) and Antonio (R7) mentioned that they had opportunities to learn about the local culture and to practice languages with the local-born populations. Compared to recent immigrant participants, Allen (L5), a long-term immigrant, used hybrid platforms to meet with local biking clubs. He said he had been in the U.S. for a long time so he did not seek opportunities to meet with other Russian immigrants.

Three participants used PNAs to meet with local-born populations. Rahul (R12) used Tinder to find dating partners but also to find new people to talk to. Akani (R2) and Zhu (R13) were PNA users at the time of participating in the study. Akani (R2) met a person via Mingle, and the person provided Akani (R2) with free housing when he first arrived. Zhu (R13) used WeChat for online language exchange with local-born populations. Through these interactions on WeChat, Zhu (R13) gained information that helped him orient himself around the city and learn about U.S. cultural norms.

5.2.2   Social Outcome: Creating New INTRA-ethnic Ties and INTER-ethnic Ties. Participants' use of hybrid community platforms often led them to create and benefit from ties through offline gatherings. Participants used the online platform features primarily for sharing event information and not for relationship development. While Allen (L5) mainly made ties with the local-born population, Antonio (R7) and Camila (R5) made new connections with people of the same ethnicity *and* with local-born populations.

> "*[The Spanish-speaking Meetup] is not only Spanish-speaking people, but people like Americans that would like to improve their Spanish skills, so you and all kinds of people. I meet ladies there that are 60 years old or more, but they're still learning Spanish; young people that have been exchange students in Spain or in Mexico; like couples that are married, like Mexican and American, and the American [who] wants to learn more Spanish, so they go there.*" [Camila (R5)]

While some participants found useful resources for addressing cultural needs through hybrid community platforms, they were also forced to face deep cultural differences. Antonio (R7) stated that he did not feel comfortable talking to American men who took baseball and football very seriously while Italian men did not. As a result, Antonio (R7) felt embarrassed in sports-related conversations and decided to learn about them on his own rather than discussing them with the American men he met at the Italian-speaking Meetup group.

> "*The biggest challenge was to fit in the American culture... I don't know anything about baseball I don't know anything about football. You know strangely enough I feel more comfortable to have a conversation with women compared to men because there's a lot of things I don't know... I speak a decent level of English so it's not about communication it's about the culture and the values that people share.*" [Antonio (R7)]

In contrast to the positive attitudes on hybrid community platforms, most participants developed negative attitudes about making new connections through PNAs or other social-matching applications. They were worried about their security, fraud and scams, and misused personal information when meeting strangers online. However, participants [Tina (R1), Camila (R5), Antonio (R7), Rahul (R12), and Nadia (L1)] thought Tinder-like applications could be helpful for them to meet long-term immigrants and local-born populations. One requirement suggested by participants [Antonio (R7), Nadia (L1)] was that the application and users should be managed by trustworthy institutions like schools or non-profit organizations.

6 RESOURCE-DRIVEN ICT USE

6.1 Seeking Resources from an Ethnically Uniform Population (Group 3)

Public online groups for ethnic communities were the primary types of Group 3 ICTs. These ICTs were used when participants' primary motivations were to seek resources from their ethnic community within their host country. ICT platforms included Facebook groups and independent platforms such as an online forum for local Chinese communities. Compared to Group 1 ICTs, these groups were public and typically open to anyone who shared the same ethnicity, though some required some level of screening to join.

Our participants visited public ethnic groups to seek settlement and financial needs necessary for adaptation. Although seeking resources was the primary motivation, participants were also able to create new INTRA-ethnic ties. While these public ethnic groups allowed recent immigrants to address settlement and financial needs, one participant cited that these groups were not able to address cultural needs.

6.1.1 Settlement and Financial Needs Addressed. Through these online public groups, Yu (R4), Ng (R6), Huang (R9), Zhang (R11), and Zhu (R13) accessed resources to fulfill their *settlement needs*. These resources cover a wide range of orienting information, tangible resources and services, such as housing, used items, and ridesharing. In addition to these tangible resources, participants also sought local education or medical resources. Zhang (R11) also noted that she was able to find everything she needed through the online public group in her area.

Employment, which addresses financial needs, was another type of resource that could be accessed through these online ethnic communities. Participants found it challenging to find a job in their area of expertise through public job advertisements and job search websites such as Indeed.com and Monster.com. Akani (R2), Bing (R3), Yu (R4), and Lucas (R8) all reported similar difficulties in finding employment after migration. Akani (R2) and Bing (R3) found part-time jobs and other income sources through other channels (presented in subsection 6.2).

Our results show that online ethnic groups provided opportunities to recent immigrants to access local job information, though these were not always publicly available. Yu (R4) found a job through an open Taiwanese community group on Facebook. Because her expertise did not fit the local labor market demands, Yu (R4) was unable to find a job through public advertisements or job search websites. Therefore, Yu (R4) sought job leads through the online Taiwanese community.

> "*I find a job from the other Taiwanese girl who was staying here for over 20 years. There is a Facebook [group] called 'Taiwanese People in [a Midwestern state].'... She introduced me, so that's why I have a job... I just [posted in the group]: 'Is there any job opening in [the state]? Does anybody know?' Then she just answered me... I will say for Taiwanese, I think if you know somebody who work there, then they introduce you. I think it will be faster [to get a job].*" [Yu (R4)]

Though some participants said they could find everything they needed, these same public ethnic groups provided limited cultural resources, such as language, that were needed for immigrants to adapt and thrive in their new society. Although Huang (R9) frequently sought local information and traded second-hand items in the local online forum for Chinese immigrants, she noted that the group was isolated from the host society.

> "*I still think [the Chinese forum] is more about all these internal services rather than outward...Internal is like you want to find a computer so I have a computer. You want to buy a car, I have a car. All these small [last-]minute things and you can find very accessible information. But outward, like, how you are doing in the U.S., how can you*

be more comfortable in the U.S.? There is not many information about those things."
[Huang (R9)]

The majority of our long-term immigrant participants, [Nadia (L1), Elise (L2), Claire (L4)], were satisfied about their life in the U.S., and unlike our recent immigrant participants, did not see the need to make new connections for resource-seeking purposes. Instead, they themselves became the resource providers to newcomers without using ICTs. Only two of the five long-term immigrants reported using ICTs to make new connections [Li (L3), Allen (L5)]. Li also supported recent immigrants in her ethnic community (presented in subsection 5.1). However, there were no reports as to how the use of these ICTs addressed their adaptation needs when they were new to the U.S.

6.1.2 Social Outcome: Creating New Weak INTRA-ethnic Ties. Despite participants' resource-driven motivations for visiting these online ethnic groups, participants created personal relationships. For recent immigrant participants, this happened after other members in the open ethnic group offered resources. Connections were then built between our participants and the members who offered resources. Yu (R4), in the case mentioned above, built a personal relationship with the woman who referred her to her job. The woman further introduced Yu (R4) to a larger network of Taiwanese immigrants in the area, which provided opportunities for making new INTRA-ethnic weak ties. At the time of the study, Yu (R4) had not met with this group of Taiwanese immigrants face-to-face, but she planned to participate in the gatherings soon.

Ng (R6) also shared her experience making a new connection with another Vietnamese woman she met in a public Vietnamese Facebook group. When she first reached out to the group for information before moving from an East-Coast city to a Midwestern town, one woman replied. The connection was built online first, and after she moved to the town, Ng (R6) transferred this relationship offline.

> "*Actually I know a friend in [the Midwestern town] through [the Vietnamese FB group].
> Because I didn't know any Vietnamese in [the Midwestern town] before we moved... I
> joined the [Vietnamese FB group], and then I ask[ed] information and she come to answer
> and that's why I know her. After I came and I send my address to invite her to come, and
> that's how we became friends.*" [Ng (R6)]

6.2 Seeking Resources from an Ethnically Diverse Population (Group 4)

Similar to Group 3, participants' primary motivation using Group 4 ICTs was to address their settlement and financial needs. These ICTs included: *public specific-interest groups* and *P2P commerce platforms*. The former includes Glow (an online community for women); the latter includes Craigslist, Facebook trade groups and marketplaces, and Airbnb. Notably, among the four groups of ICTs, this is the only group through which interpersonal connections were unlikely to be established. Participants reported safety and trust-related concerns about making connections with other users of Groups 4 ICTs and of the resources offered from these individuals.

6.2.1 Settlement and Financial Needs Addressed. Public specific-interest groups such as Glow were beneficial for providing informational resources related to settlement needs. Seeking orienting information and local news, for example, Yu (R4) followed her neighborhood's Facebook news page. She did not, however, make any new interpersonal connections. Nadia (L1) talked about sharing and seeking mothering experience as a Glow member. Participants used the P2P commerce platforms such as Craigslist, Facebook trade groups, and Airbnb for exchanging and trading tangible settlement resources [housing: Tina (R1), Camila (R5); second-hand items trade: Bing (R3), Huang (R9)].

To help address their financial needs, some participants searched for and found part-time jobs [Akani (R2) and Bing (R3)] or extra-income opportunities [Bing (R2), Camila (R5), Antonio (R7)]. Akani (R2) managed to find part-time jobs as a delivery driver through Craigslist. Bing (R3) and Camila (R5) looked for opportunities to participate in research studies, which allowed them to receive extra income and "*contribute something useful*" [Bing (R3)]. Antonio (R7) advertised his private Italian conversation lessons on Craigslist as well. Camila (R5) used Airbnb in the first few weeks after moving to the U.S. These P2P commerce platforms were specifically used if participants did not have access to other channels for resources, such as their place of employment, local non-profit organizations, or online ethnic groups.

6.2.2 Social Outcome: Little Effect on One's Social Network. Most participants' use of these online ethnically diverse spaces did not lead to new connections. Instead, the majority of interactions were limited to the level of resource exchanges rather than establishment of new personal relationships. Some participants described their mistrust of platform content. Nadia (L1), for example, studied at a U.S. college and had lived in the U.S. for more than five years. As a long-term immigrant, she described being comfortable making offline connections with individuals who were local-born, and she said she successfully adapted in the U.S. However, when asked whether she made personal connections with other users of the mothering online forum, her answer was a strong no:

> "*I'm a first-time mom, so I am on that app [Glow]... if I have problems, I post too... 'Oh [has] this happened to any of [your children], please moms comment.' So they comment, from all over the world if somebody experienced with that earlier. That's the only thing but I never exchange messages or numbers or Facebook IDs, nothing like that, just I keep it to that app. If somebody comments on my post, yes 'thank you so much for the information,' I'll write. But there is no way that you can stay in touch with person. That's it. You just comment and you just forget that.*" [Nadia (L1)]

A common concern was vulnerability to fraud and scams particularly when resources were associated with money and tangible items. Bing (R3) was also worried that some site content posted and sold on Craigslist might be illegal. After having had two negative experiences trading with local-born populations on Craigslist, Huang (R9) expressed a higher level of trust in a local Chinese public forum.

> "*There was this gentleman who send out the posting [selling a second-hand car] on Craigslist... And then to buy the car I have to buy five Target gift cards... I asked my faculty and my mentor and he says, 'No. It's so fake. Don't go buy it.'... The next thing with Craigslist is I was trying to sublease my apartment... I got the check from the guy [who was interested in subleasing] and it's way more than what the rent is all about... I [told the guy], 'no I'm not going to accept your check'... Then many people were saying the same thing [to me], 'Craigslist has a lot of fake thing.' I'm trust [the public Chinese online forum in her town] and never Craigslist.*" [Huang (R9)]

7 DISCUSSION

In this paper we contribute findings from a set of semi-structured interviews to answer these three research questions: 1) What ICTs do recent immigrants use for developing new social capital to address adaptation needs? 2) How do ICTs mediate recent immigrants' adaptation needs? and 3) What are the opportunities for ICTs to better facilitate immigrants' adaptation and what limitations exist?

To summarize, per Table 2, settlement needs such as housing, transportation, and orienting information, were easy to come by via ICTs. However, emotional needs were not salient in our results. One possible explanation for this difference is that recent immigrants address their emotional needs

by retaining their ties to their home country through ICTs [4, 47, 89], while long-term immigrants feel more comfortable addressing emotional needs with their new social networks in the host country. However, whether immigrants primarily address their emotional needs with their social networks in the host country is under debate [17, 21, 59, 64] and presents an opportunity for further research.

Surprisingly, Group 2 ICTs, those used for socially-driven motivations to access an ethnically diverse population, were most effective in creating new ties. Group 4 ICTs were least effective. Group 2 ICTs supported the creation of both INTRA- and INTER-ethnic social ties and helped immigrants address several of their adaptation needs. In contrast, Group 4 ICTs, those used for seeking resources from ethnically diverse populations, were not beneficial for creating new social ties, primarily because of trust-related issues. On the other hand, participants generally trusted connections and resources from an ethnically uniform population (Groups 1 and 3). In the subsections that follow, we discuss ways to foster new INTER-ethnic ties and resource exchanges within an ethnic community. We conclude by discussing how to facilitate safer resource access and exchange within ICTs to better support resource-driven immigrants.

7.1 Fostering New INTER-Ethnic Ties

Immigration is an instance of an important life change, and research indicates that life changes motivate people to make new connections [10, 19]. Research also indicates that ICTs are used to develop social capital during these life transitions [32, 47, 48]. We found that Group 2 ICTs, which participants used for socially driven motivations to access ethnically-diverse populations, were most effective in creating new social connections and addressing adaptation needs among the four ICT groups. Consistent with past research [21, 48], Group 2 ICTs were beneficial in that they created new connections and mediated settlement and cultural resource needs. For instance, Damian and Van Ingen found that the frequency of use of social-network sites had a positive impact on the number of INTER-ethnic ties immigrants in the Netherlands held [21]. This study also revealed improvements in immigrants' overall life quality. However, our participants reported concerns meeting local-born individuals through ICTs such as interest-specific online groups and PNAs. To address these concerns and foster INTER-ethnic ties, we suggest ways to reduce the uncertainty of meeting strangers in ICTs with ethnically diverse populations (Groups 2 and 4) and ways to increase the diversity of ethnicity in Groups 1 and 3 ICTs.

7.1.1 Reducing Uncertainty of Meeting Strangers within an Ethnically Diverse Context. Participants had concerns using ICTs to reach ethnically diverse populations, such as interest-specific online groups and PNAs, to create INTER-ethnic ties. These concerns are not unique to immigrant users [49, 88]. To mitigate newcomers' concerns and uncertainties, Hsiao and Dillahunt suggested features such as finding commonalities among newcomers and strangers [49]. Mayer et al. suggested that matching people who are both unique in an environment could facilitate social-matching [70]. At the same time, it is important to note that recent immigrants could be more vulnerable than other types of newcomers such as travelers or domestic migrants. They may, for example, lack knowledge of local social norms, and without being adapted fully, their privacy and security could be at risk when socializing online [45]. To better understand how to manage these risks, future research should investigate the differences between the risks recent immigrants face to the risks other newcomers face.

7.1.2 Increasing Diversity of ICTs which Have Ethnically Uniform Users. To increase immigrants' opportunities to create INTER-ethnic ties through ICTs, we suggest making ethnically uniform ICTs more inclusive by connecting immigrants to local-born individuals who want to learn new languages and more about different cultures. Although creating INTER-ethnic ties through ethnically uniform

ICTs might sound contradictory, we believe there is a way to encourage mutual reciprocity in these settings. Our participants reported using the PNA function of WeChat to make connections with the local-born who were interested in language exchange. Although WeChat is an ethnically uniform ICT primarily used by the Chinese-speaking population, its PNA feature is open to the public. Increasing the inclusiveness of ethnically uniform platforms like WeChat could lead to opportunities for new INTER-ethnic ties and could address unfulfilled cultural needs that ICTs with ethnically uniform populations were not able to support. Future studies should explore how ethnicity affects an immigrant's choice of ICTs for creating new connections.

7.2 Increasing Benefits of New INTRA-Ethnic Ties

As might have been expected, our participants reported high trust in people and resources mediated from ethnically uniform populations (Groups 1 and 3). Despite having primarily resource-driven motivations, participants still benefited from making new connections within their ethnic community (i.e., they formed INTRA-ethnic ties). From these connections, participants accessed employment information and received job referrals from the INTRA-ethnic ties they made through these public ethnic groups. We confirmed that offline INTRA-ethnic ties are beneficial for new immigrant job searches [23, 77, 81] but found that this holds true in online contexts as well. Dekker and Engbersen found that new immigrants join ethnically uniform online communities to ask for settlement and employment resources [22]. In addition to receiving information about where jobs are located, immigrants received job referrals in addition to basic employment information via Group 3 ICTs only. We extend prior research by showing that INTRA-ethnic ties are beneficial in online contexts *and* beyond providing basic job information.

We found differences between Group 1, which included private ethnic groups, and Group 3 ICTs, which included public ethnic groups. Group 1 ICTs, used for making connections with ethnically uniform populations, supported the smooth exchange of resources among participants' ethnic communities. However, these groups did not introduce new job opportunities, or address participants' financial needs. We believe that weak INTRA-ethnic ties (those in Group 3) provide employment resources, while strong INTRA-ethnic ties (those in Group 1) do not. This is consistent with Granovetter's weak-tie theory that states that strong ties are less likely to introduce new job opportunities because of the overlapping resources among tightly connected networks. This finding is also consistent with past immigration research [79, 81]. However, our finding seems to contradict those prior studies finding that strong ties mediated by ICTs were helpful for job searches [13, 39]. Future researchers should investigate how the online context within ethnic communities influences immigrants' job seeking outcomes.

We found that both Group 1 (ICTs used for new connections with an ethnically uniform population) and Group 3 (ICTs used for seeking resources from an ethnically uniform population) supported ridesharing among immigrant communities. In Lucas' (R8) case, ridesharing among the Chilean community could be important given their limited access to private vehicles. Lucas and his wife offered ridesharing services as a contribution to their ethnic community because they had benefited from other members in the community. This finding is consistent with past research that suggests that applications of the sharing economy can benefit resource-constrained communities [25, 27, 51, 65]. For example, Lovejoy and Handy studied ridesharing among Mexican immigrants in Los Angeles and suggested that belonging to the Mexican community allows an individual to access free or low-cost ridesharing from other community members [65]. Dillahunt and Malone also suggested that the sharing economy could support reciprocity among resource-constrained communities and thus enhance collective efficacy within a community [27]. An open question for future research is whether the sharing economy could be beneficial in these communities [26, 28].

How can the sharing economy model be adapted to support disconnected immigrant communities like Elise's (L2) to foster interactions between long- and short-term immigrants?

7.3 Increasing Safe and Trusted Transactions in Resource-driven Environments

Our participants' sentiments reflect those of past research that suggest a role for intermediaries in building trust among marginalized communities (i.e., refugees, resource-constrained individuals, and individuals in developing areas) [3, 25, 50, 80]. Guberek and colleagues also argued that technical platforms should pay attention to protect undocumented immigrants' privacy and safety [45]. Our participants indicated that they trusted service providers such as non-profit organizations and schools. Building on past work, a trustworthy institution could have two approaches to support immigrants' trust in local-born populations and facilitate safe transactions and social-matching. First, these institutions could provide or support applications for resource exchange between immigrants and local-born populations. Second, institutions such as police stations could provide a safe public space to facilitate safe transactions [27]. In fact, this has been enacted in some U.S. neighborhoods [92].

7.4 Limitations

We report three limitations of our study. First, we recruited participants with basic conversational English ability. This is a research practice of past HCI studies [11, 12, 62] to reduce translation costs, specifically when a study covers multiple language-speaking groups [62]. However, because English was not our participants' native language, it is possible that we did not precisely convey their thoughts in the interviews. In addition, limiting our study to immigrants with basic conversational English ability excludes those immigrants with significant language barriers who may have faced a different set of adaptation needs and challenges from what our results convey [45].

Finally, the political atmosphere in the U.S. has caused additional challenges for foreign-born populations [76]. Therefore, some immigrants might have perceived our study as risky and avoided participation. While we believe that our findings are beneficial to improving ICTs to enhance immigrants' adaptation and social capital, our study results may not fully represent the needs and experiences of all U.S. immigrants.

8 CONCLUSION

Drawing from a series of interviews with thirteen recent immigrants and five long-term immigrants, our work provides insights into the opportunities for ICTs to support the successful adaptation of new immigrants to the U.S. We found that the recent immigrants from our study connected to public ethnic groups online to address settlement and financial needs. We also found that private online groups facilitated active resource exchange among ethnic communities, which could strengthen immigrant communities. Prior research suggests that connections to local-born populations are beneficial to thrive in a new country. Indeed, hybrid community platforms, which are typically ethnically diverse, offered opportunities for immigrants to make connections with the local-born. However, participants had lower trust in users and resources on other ICTs with ethnically diverse users such as Craigslist and PNAs. We contribute implications for strengthening relationships between immigrants and local-born populations. Building from prior research, we suggest reducing uncertainty around meeting the local-born, fostering reciprocity among immigrant communities, and facilitating safe resource exchanges.

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